Claims

1.   A gas supply facility for a chamber, comprising:

a plurality of pressure type flow controllers connected in parallel;

a controller to control the operation of an aforementioned plurality of pressure type flow controllers; and

a chamber exhausted by a vacuum pump, wherein

the pressure type flow rate controller comprises an orifice, a pressure detector provided on an upstream side of the orifice, a control valve provided on an upstream side of the pressure detector, and a computation control part wherewith a gas flow rate Qc passing through the orifice is computed with pressure $P1$ detected by the pressure detector using a formula $Qc=KP1$ (where K is constant), and a difference Qy with the set flow rate Qs is output to a control valve as a driving signal, thereby maintaining the ratio $P1/P2$, of a pressure $P1$ on the upstream side of the orifice and a pressure $P2$ on the downstream side, as approximately two or more, and also allows accurate flow control over a wide flow rate range by making one of the pressure type flow controllers to be a controller to control the gas flow rate range up to 10% of the maximum flow rate to be supplied to a chamber, while the remaining pressure type flow controller(s) comprise controller(s) to control the rest of the gas flow rate range.

2.   A gas supply facility to a chamber as claimed in Claim 1, wherein at least two said pressure type flow controllers are connected in parallel, and one is made to be a controller for a small flow quantity range, while the other is made to be a pressure type flow controller for a large flow quantity range.

3.   A gas supply facility to a chamber as claimed in Claim 1, wherein at least two said pressure type flow controllers are connected in parallel, and a flow rate range of one said pressure type flow controller, for a small flow quantity, is made to be 0.1-10% of the maximum flow rate, while a flow rate range of another said pressure type flow controller, for a large flow quantity, is made to be 10-100% of the maximum flow rate.

4.   A gas supply facility to a chamber as claimed in Claim 1, wherein said plurality of pressure type flow controller is operated, starting with a pressure type flow controller for a smaller flow quantity range to one for a larger flow quantity, in turn, by means of control signals remitted from a signal conversion part in the controller.

5.   A gas supply facility to a chamber as claimed in Claim 1, further comprising a rising rate setting mechanism of control signals to be remitted to said pressure type flow controllers allotted for all the flow rate ranges of the flow controllers, and said pressure type flow controllers supply the set flow rate of gas after a specified lapse of time following the remittance of the aforementioned control signals.

6.   A method for internal pressure control of a chamber, comprising the steps of:

continuously operating a vacuum pump to decompress, through an exhaust line equipped with a conductance valve, a chamber supplied with a gas from a gas supply facility equipped with a pressure type flow controller;

determining relationships between a gas supply flow rate and an internal pressure of the chamber at both the maximum degree and minimum degree of opening of the aforementioned conductance valve, respectively, to ascertain a control range for the gas supply flow rate to the chamber and a control range of the internal pressure of the chamber; and

regulating the gas flow rate, while supplying gas from the gas supply facility, to the gas supply flow rate corresponding to the internal pressure of the chamber to be set, determined from the relationship between the gas supply flow rate and the internal pressure of the chamber, to maintain the chamber at the desired set pressure.

7.   A method for an internal pressure control of a chamber, comrpsing the steps of:

suppling a chamber connected to both a gas supply facility and an exhaust system having a conductance vale; and

maintaining an internal pressure of the chamber at a set pressure by regulating both an opening of the conductance valve of the exhaust system and a supply flow rate of the gas supply facility.

8.   A method for an internal pressure control of a chamber as claimed in Claim 6, wherein said gas supply facility comprises:

a plurality of pressure type flow controllers connected in parallel;

a controller to control the operation of the plurality of pressure type flow

controllers; and wherein

the pressure type flow controller comprises an orifice, a pressure detector provided on an upstream side of the orifice, a control valve provided on an upstream side of the pressure detector, and a computation control part wherewith a gas flow rate Q_c passing through the orifice is computed with pressure P_1 detected by the pressure detector using a formula $Q_c = KP_1$ (where K is a constant) and a difference Q_y with the set flow rate Q_s is outputted to a control valve as a driving signal, thereby maintaining the ratio P_1/P_2, of a pressure P_1 on the upstream side of the orifice and a pressure P_2 on the downstream side, as approximately two or more, and also allows accurate flow control over a wide flow rate range by making one of the pressure type flow controllers to be a controller to control the gas flow rate range up to 10% of the maximum flow rate to be supplied to a chamber, while the remaining pressure type flow controller(s) comprise controller(s) to control the rest of the gas flow rate range; and wherein

the controller comprises an input setting part to set a gas flow rate to be supplied to a chamber and a signal conversion part to convert an input value to the said input setting part into control signals to pressure type flow controllers, thus making it possible to accurately control flow rate control over a wide flow rate range by remitting control signals from a signal conversion part to all the pressure type flow controllers.